

We Claim:

1. A superabsorbent composition, comprising:

a superabsorbent material having a glass transition temperature higher than the temperature of use; and

an elastomer having a glass transition temperature lower than the temperature of use;

the superabsorbent material and the elastomer are in a two-phase superabsorbent composition wherein the superabsorbent material is in a first phase and the elastomer is in a second phase.

2. The superabsorbent composition of Claim 1, wherein the

superabsorbent material comprises a cross-linked partially neutralized polyacrylic acid.

3. The superabsorbent composition of Claim 1, wherein the first phase superabsorbent material is a continuous phase and the second phase elastomer is a dispersed phase.

4. The superabsorbent composition of Claim 1, wherein the first phase superabsorbent material is a dispersed phase and the second phase elastomer is a continuous phase.

5. The superabsorbent composition of Claim 1, wherein the superabsorbent material is derived from a precursor solution comprising a copolymer containing a latent crosslinker.

6. The superabsorbent composition of Claim 5, wherein the latent crosslinker ranges from 1 to 8% by weight.

7. The superabsorbent composition of Claim 5, wherein the latent crosslinker ranges from 2 to 6% by weight.

8. The superabsorbent composition of Claim 5, wherein the latent polymerizable crosslinker comprises a comonomer selected from α,β -ethylenically unsaturated comonomers having an additional functional group capable of reacting with carboxyl groups.

9. The superabsorbent composition of Claim 8, wherein the latent polymerizable crosslinker comprises a comonomer selected from aminopropyl vinyl ether, ethylene glycol allyl ether, 2-hydroxyethyl methacrylate, and ethylene glycol vinyl ether.

10. The superabsorbent composition of Claim 5, wherein the copolymer comprises acrylic acid and a polymerizable crosslinker.

11. The superabsorbent composition of Claim 1, wherein the superabsorbent material is derived from a precursor solution comprising a superabsorbent precursor and a nonpolymerizable crosslinker.

12. The superabsorbent composition of Claim 11, wherein the nonpolymerizable crosslinker comprises a compound selected from the group consisting of ethylene glycol, diethylene glycol, triethylene glycol, polyethelene glycol, polyvinyl alcohol, polyethylele oxide, glycerol, 1,3-propanediol, 1,4-butanediol, 1,5-pentanediol, 1,6-hexanediol, 1,8-octanediol, 1,1,1-trimethylolpropane, 1,4-butanediamine, 1,5-pantanediamine, 1,6-hexanediamine, diethylenetriamine, and analogs and derivatives thereof.

13. The superabsorbent composition of Claim 12, wherein the nonpolymerizable crosslinker comprises a compound having at least 2 functional groups capable of reacting with carboxyl groups.

14. The superabsorbent composition of Claim 11, wherein the nonpolymerizable crosslinker ranges from 1 to 8% by weight.

15. The superabsorbent composition of Claim 11, wherein the nonpolymerizable crosslinker ranges from 2 to 6% by weight.

16. The superabsorbent composition of Claim 1, the superabsorbent material further comprising a crosslinked and partially hydrolyzed copolymer of an α -olefin with one of an α,β -ethylenically unsaturated organic acid anhydride and ester.

17. The superabsorbent composition of Claim 16, wherein the crosslinked and partially hydrolyzed copolymer of an α -olefin with one of an α,β -ethylenically unsaturated organic acid anhydride and ester comprises a crosslinked and partially hydrolyzed copolymer of isobutylene and maleic anhydride.

18. The superabsorbent composition of Claim 16, wherein the superabsorbent material is derived from a partially hydrolyzed copolymer of an α -olefin with one of an α,β -ethylenically unsaturated organic acid anhydride and ester and a nonpolymerizable latent crosslinker.

19. The superabsorbent composition of Claim 18, wherein the superabsorbent material is derived from a partially hydrolyzed copolymer of isobutylene and maleic anhydride and a nonpolymerizable latent crosslinker.

20. The superabsorbent composition of Claim 1, wherein the superabsorbent material comprises one of the group consisting of hydrolyzed starch-acrylonitrile graft copolymers, partially neutralized starch-acrylonitrile graft copolymers, partially neutralized saponified vinyl-acetate acryl-ester copolymers, hydrolyzed acronitrile copolymers, carboxymethyl cellulose, carboxymethyl starch, chitosan salts, partially neutralized polyaspartic acid, polyquaternary ammonium salts, polyvinyl amines, polyvinyl imines, and combinations thereof.

21. The superabsorbent composition of Claim 1, wherein the elastomer is derived from a latex emulsion.

22. The superabsorbent composition of Claim 1, wherein the elastomer has a glass transition temperature below room temperature.

23. The superabsorbent composition of Claim 1, wherein the elastomer has a glass transition temperature less than 0°C.

24. The superabsorbent composition of Claim 1, wherein the elastomer has a glass transition temperature less than -25°C.

25. The superabsorbent composition of Claim 1, wherein the elastomer is in a dispersed phase and the superabsorbent material is in a continuous phase.

26. The superabsorbent composition of Claim 1, wherein the superabsorbent composition comprises a film.

27. The superabsorbent composition of Claim 25, wherein the superabsorbent composition comprises a macroporous film.

28. The superabsorbent composition of Claim 1, wherein the superabsorbent composition comprises a particle.

29. The superabsorbent composition of Claim 1, wherein the particle has a size of 50 to 1,000 microns.

30. The superabsorbent composition of Claim 1, wherein the particle has a size of 150 to 800 microns.

31. The superabsorbent composition of Claim 1, wherein the superabsorbent composition comprises a fiber.

32. The superabsorbent composition of Claim 31, wherein the fiber has a diameter of 0.1 to 100 microns.

33. The superabsorbent composition of Claim 31, wherein the fiber has a diameter of 1 to 70 microns.

34. The superabsorbent composition of Claim 31, wherein the fiber has a diameter of 5 to 50 microns.

35. A personal care absorbent article comprising the superabsorbent composition of Claim 1.

36. A protective garment comprising the superabsorbent composition of Claim 1.

37. A macroporous superabsorbent film, comprising:
65%-92% by weight of a superabsorbent material; and
8%-35% by weight of an elastomer derived from latex emulsion;
wherein the macroporous superabsorbent film having a two-phase morphology wherein the superabsorbent material is in a first phase and the elastomer derived from latex is in a second phase.

38. The film of Claim 37, wherein the superabsorbent material comprises a crosslinked partially neutralized polyacrylic acid.

39. The film of Claim 37, wherein the superabsorbent material is derived from a precursor solution comprising a copolymer containing a latent crosslinker.

40. The film of Claim 39, wherein the latent crosslinker ranges from 1 to 8% by weight.

41. The film of Claim 39, wherein the latent crosslinker ranges from 2 to 6% by weight.

42. The film of Claim 39, wherein the latent polymerizable crosslinker comprises a comonomer selected from α,β -ethylenically unsaturated comonomers having an additional functional group capable of reacting with carboxyl groups.

43. The superabsorbent composition of Claim 39, wherein the latent polymerizable crosslinker comprises a comonomer selected from aminopropyl vinyl

ether, ethylene glycol allyl ether, 2-hydroxyethyl methacrylate, and ethylene glycol vinyl ether.

44. The film of Claim 37, wherein the superabsorbent material is derived from a precursor solution comprising a superabsorbent precursor and a nonpolymerizable crosslinker.

45. The film of Claim 44, wherein the nonpolymerizable crosslinker comprises a compound having at least 2 functional groups capable of reacting with carboxyl groups.

46. The film of Claim 44, wherein the nonpolymerizable crosslinker comprises a compound selected from the group consisting of ethylene glycol, diethylene glycol, triethylene glycol, polyethelene glycol, polyvinyl alcohol, polyethylele oxide, glycerol, 1,3-propanediol, 1,4-butanediol, 1,5-pentanediol, 1,6-hexanediol, 1,8-octanediol, 1,1,1-trimethylolpropane, 1,4-butanediamine, 1,5-pentanediamine, 1,6-hexanediamine, diethylenetriamine, and analogs and derivatives thereof.

47. The film of Claim 44, wherein the nonpolymerizable crosslinker ranges from 1 to 8% by weight.

48. The film of Claim 44, wherein the nonpolymerizable crosslinker ranges from 2 to 6% by weight.

49. The film of Claim 37, the superabsorbent material further comprising a crosslinked and partially hydrolyzed copolymer of an α -olefin with one of an α,β -ethylenically unsaturated organic acid anhydride and ester.

50. The film of Claim 49, wherein the crosslinked and partially hydrolyzed copolymer of an α -olefin with one of an α,β -ethylenically unsaturated organic acid anhydride and ester comprises a crosslinked and partially hydrolyzed copolymer of isobutylene and maleic anhydride.

51. The film of Claim 49, wherein the superabsorbent material is derived from a partially hydrolyzed copolymer of an α -olefin with one of an α,β -ethylenically unsaturated organic acid anhydride and ester and a nonpolymerizable latent crosslinker.

52. The film of Claim 51, wherein the superabsorbent material is derived from a partially hydrolyzed copolymer of isobutylene and maleic anhydride and a nonpolymerizable latent crosslinker.

53. The film of Claim 37, wherein the elastomer has a glass transition temperature below about 25°C.

54. The film of Claim 37, wherein the elastomer has a glass transition temperature less than 0°C.

55. The film of Claim 37, wherein the elastomer has a glass transition temperature less than -25°C.

56. The film of Claim 37, wherein the macroporous superabsorbent film has an open area of about 10 to 70% based on total area of the macroporous film.

57. The film of Claim 37, wherein the macroporous superabsorbent film has an open area of about 20 to 60% based on total area of the macroporous film.

58. The film of Claim 37, wherein the macroporous superabsorbent film has an open area of about 25 to 50% based on total area of the macroporous film.

59. The film of Claim 37, wherein the macropores have a mean pore size from about 100 μm to 10,000 μm .

60. The film of Claim 37, wherein the macropores have a mean pore size from about 1000 μm to 6000 μm .

61. The film of Claim 37, wherein the macropores have a mean pore size from about 1500 μm to 4000 μm .

62. The film of Claim 37, wherein the film is crosslinked by one of heat curing, electron beam, microwave, or combinations thereof.

63. An absorbent article comprising the macroporous superabsorbent film of Claim 37.

64. The absorbent article of Claim 63, wherein the macroporous superabsorbent film is laminated to an absorbent material.

65. The absorbent article of Claim 64, wherein the macroporous superabsorbent film/absorbent material lamination is multilayered.

66. The absorbent article of Claim 63, wherein the absorbent article is selected from the group consisting of diapers, training pants, swim wear, absorbent underpants, baby wipes, adult incontinence products, feminine hygiene products, facial tissues, and paper towels.

67. A protective garment comprising the macroporous superabsorbent film of Claim 37.

68. A method for producing a superabsorbent composition, comprising:

high intensity mixing a superabsorbent precursor and a latex emulsion to form a mixture including a dispersed elastomer phase and a continuous superabsorbent phase;

forming a composition from the mixture;

drying the composition; and

crosslinking the composition by heat curing.

69. The method of Claim 68, wherein the superabsorbent composition is formed by at least one of the group consisting of casting, spinning, grinding, pressing, and extruding.

70. The method of Claim 68, wherein the superabsorbent composition is a film.

71. The method of Claim 68, wherein the superabsorbent composition is a macroporous film.

72. The method of Claim 68, wherein the macroporous film comprises 8 to 35% elastomer.

73. The method of Claim 68, wherein the superabsorbent composition comprises a particle.

74. The method of Claim 73, wherein the particle has a size of 50 to 1,000 microns.

75. The method of Claim 73, wherein the particle has a size of 150 to 800 microns.

76. The method of Claim 68, wherein the superabsorbent composition comprises a fiber.

77. The method of Claim 76, wherein the fiber has a diameter of 0.1 to 100 microns.

78. The method of Claim 76, wherein the fiber has a diameter of 1 to 70 microns.

79. The method of Claim 76, wherein the fiber has a diameter of 5 to 50 microns.

80. The method of Claim 68, wherein the superabsorbent material comprises a crosslinked partially neutralized polyacrylic acid.

81. The method of Claim 80, wherein the superabsorbent material is derived from a precursor solution comprising a copolymer of acrylic acid and a polymerizable latent crosslinker.

82. The method of Claim 81, wherein the latent crosslinker ranges from 1 to 8% by weight.

83. The method of Claim 81, wherein the latent crosslinker ranges from 2 to 6% by weight.

84. The method of Claim 81, wherein the latent polymerizable crosslinker comprises a comonomer selected from α,β -ethylenically unsaturated comonomers having an additional functional group capable of reacting with carboxyl groups.

85. The method of Claim 84, wherein the latent polymerizable crosslinker comprises a comonomer selected from aminopropyl vinyl ether, ethylene glycol allyl ether, 2-hydroxyethyl methacrylate, and ethylene glycol vinyl ether.

86. The method of Claim 68, wherein the superabsorbent material is derived from a precursor solution comprising a superabsorbent precursor and a nonpolymerizable crosslinker.

87. The method of Claim 86, wherein the nonpolymerizable crosslinker comprises a compound having at least 2 functional groups capable of reacting with carboxyl groups.

88. The method of Claim 86, wherein the nonpolymerizable crosslinker comprises a compound selected from the group consisting of ethylene glycol, diethylene glycol, triethylene glycol, polyethylene glycol, polyvinyl alcohol, polyethylene oxide, glycerol, 1,3-propanediol, 1,4-butanediol, 1,5-pentanediol, 1,6-

hexanediol, 1,8-octanediol, 1,1,1-trimethylolpropane, 1,4-butanediamine, 1,5-pentanediamine, 1,6-hexanediamine, diethylenetriamine, and analogs and derivatives thereof.

89. The method of Claim 86, wherein the nonpolymerizable crosslinker ranges from 1 to 8% by weight.

90. The method of Claim 86, wherein the nonpolymerizable crosslinker ranges from 2 to 6% by weight.

91. The method of Claim 68, further comprising mixing a second superabsorbent precursor with the superabsorbent precursor and the latex emulsion.

92. The method of Claim 91, wherein the second superabsorbent precursor comprises a partially hydrolyzed copolymer of isobutylene and maleic anhydride.

93. The method of Claim 68, wherein a latex material of the latex emulsion has a glass transition temperature of less than about 25°C.

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94. The method of Claim 68, wherein the latex material of the latex emulsion has a glass transition temperature of less than about 0°C.

95. The method of Claim 68, wherein the latex material of the latex emulsion has a glass transition temperature of less than about -25°C.

96. The method of Claim 68, wherein the superabsorbent composition is cured at a temperature of about 100°C to 240°C.

97. The method of Claim 68, wherein the superabsorbent composition is cured at a temperature of about 120°C to 200°C.

98. The method of Claim 96, wherein the superabsorbent composition is cured for about 20 minutes to 40 minutes.

99. An absorbent article comprising the superabsorbent composition of Claim 68.

100. A protective garment comprising the superabsorbent composition of Claim 68.